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Species of *Tethina* Haliday from the Sahara and inland biotopes of the Mediterranean subregion (Diptera: Tethinidae)

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Abstract

Thirteen species of *Tethina* Haliday, 1837 are reported from desert and other continental localities of the Mediterranean subregion. The records from remote inland places confirm the presence of these flies in biotopes that are sometimes situated very far from the sea coast. Material from the following countries has been studied: Algeria, Egypt, Jordan, Israel, Italy, and Turkey.
Keywords: Diptera, Tethinidae, *Tethina*, deserts, Sahara, Mediterranean subregion.

Zusammenfassung

Aus Wüsten- und anderen Inlandbiotopen der Mittelmeerregion werden 13 Arten aus der Gattung *Tethina* Haliday, 1837 nachgewiesen. Diese Funde aus Binnenlandlokalitäten bestätigen das Vorkommen dieser Fliegen in Biotopen, die sich manchmal sehr weit entfernt von Meeresküsten befinden. Es wurde Material aus folgenden Ländern untersucht: Algerien, Ägypten, Jordanien, Israel, Italien und der Türkei.

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1 Introduction

Workers in dipterology which are unfamiliar with tethinids often associate these flies with the presence of seashores, particularly sandy beaches and coastal lagoons. This is true for most strictly thalassophilous species, which occur on dunes, sandy soil and wrack heaps stranded on the beach. However, many entomologists often ig-

nore or simply overlook the fact that populations of certain species also inhabit biotopes situated far off from sea littorals, sometimes several hundreds of kilometres inland, and are almost always closely dependent on the proximity of continental saline environments. It is well-known that most species, if not all, belonging to the subfamily Pelomyiinae are not thalassophilous flies, but are almost exclusively found inland, associated with meadows, mountain passes, forests, areas and waters polluted by rotting waste, industrial emissions or debris of slaughterhouses and poultry farms (sites of salt accumulation and enrichment), as well as desert oases (Mathis & Munari 1996). However, this is not infrequent in various species of the genus *Tethina*, too. Just to give some examples, it is noteworthy to remember that Hendel (1934) recorded *Tethina strobliana* (Mercier, 1923) from Hungary, and Soós (1981, 1983) cited, besides *T. strobliana*, also *T. czernyi* (Hendel, 1934) and *T. albosetulosa* (Strobl, 1900) from Hungary, an European country that has no access at all to the sea. Furthermore, other *Tethina* species such as *T. czernyi* (Hendel, 1934), *T. gobii* Beschovski & Nartshuk, 1997, *T. incisuralis* (Macquart, 1851), *T. luteosetosa* Beschovski & Nartshuk, 1997, *T. multipilosa* Beschovski & Nartshuk, 1997, *T. stobaeana* Munari, 1996, and *T. strobliana* (Mercier, 1923) were recorded by Beschovski & Nartshuk (1997) and Munari (1996, regarding *T. stobaeana* only) from remote Asiatic inland areas of the Palaearctic region (Kazakhstan, Mongolia, Tadjikistan, Turkmenistan and Uzbekistan). This is to underline the fact that, as already mentioned above, many species are not true thalassophilous (euthalassophilous) but, more simply, generic halophilous and rather thermophilous flies, which often occur in proximity to dry salty soils in areas far from the sea coast.

The present article deals with some new records of *Tethina* species from remote places of the Mediterranean subregion, in particular from desert localities (Figs. 1–3) and, in two cases (*T. strobliana* and *T. czernyi*), also from hot springs in a famous spa of north-eastern Italy and a flowering meadow in a continental area of Turkey, respectively. Most of the flies recorded here come from saline biotopes of desert oases and wadis, others from apparently salt-free zones, captured by sweeping on vegetation that was possibly growing near to concentrations of halophytes inhabiting dry salty soils (this is only a guess however, although I think it is rather likely). Relict populations of tethinids from areas near to huge salty and hypersaline basins such as the Caspian and Dead Seas are regarded here as inland populations, since these endorheic basins of tectonic origin are themselves immense relict water bodies having been formed in past geological ages.

Abbreviations and Acronyms

A.G.S.	Prof. Antonio Giordani Soika (Venice, Italy) leg.
cf.	compare with (tentative identification)
MCNV	Museo di Storia Naturale, Venice, Italy
MHNG	Muséum d'Histoire Naturelle, Geneva, Switzerland
st.	collecting station
temp.	temperature
ZMHB	Museum für Naturkunde der Humboldt-Universität, Berlin, Germany
ZSM	Zoologische Staatssammlung, München, Germany

Acknowledgements

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WHITMORE (Verona, Italy), P. CERRETTI (Rome, Italy), B. MERZ (see above), and M. VON TSCHIRNHAUS (see above) for critically reviewing the manuscript.

2 Materials and methods

The material examined for the present work mainly originates from occasional collections carried out by professional entomologists. The flies were mostly double mounted (micropinned on a block of white plastic or glued to a card slip), whereas a few others were preserved in ethanol (ZSM). Because the specimens are small, usually less than 2 mm long, their study required the use of dissecting and compound microscopes, the latter having been used mainly for a perusal of the male genitalia structures of a few apparently enigmatic individuals of uncommon and even common species.

In the text, species as well as the collecting localities of each species are listed in alphabetical order. All of the eremic places cited in this paper are marked on maps with white numbers on black dots (Figs. 1–3). The maps are north-south oriented and distances from the sea coast of the localities marked by numbers are reported in detail throughout the text. All the diacritical marks from Arabic are omitted in the text. Under the "Material examined" section of each species, significant supplementary or qualifying information is given in square brackets, and

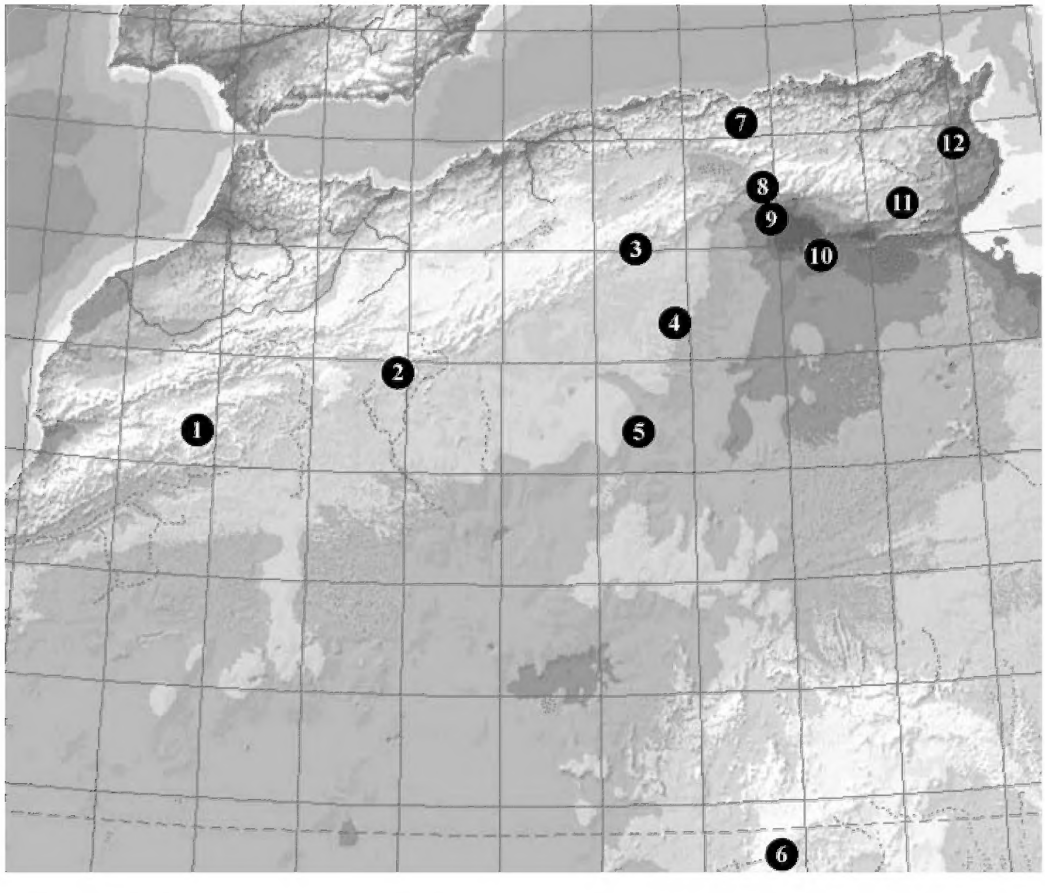

Fig. 1. Eremic biotopes of Morocco, Algeria, and Tunisia. – 1. Agdz and Taliouine. 2. Oued Bechar. 3. Oued Djedi. 4. Ghardaia. 5. El Golea Lac. 6. Tamanrasset. 7. Sebkhet Melloul. 8. Biskra and 15 km S of Biskra. 9. Chegga and Still. 10. Sidi Aoun. 11. Gafsa. 12. South of Kairouan.

includes distinctive morphological features, label data translations from Italian and French, and distance "as the crow flies" of collecting sites from the nearest sea littoral. Also, distributional data in the taxonomic account is taken from the author's updated PC database.

The recorded material is deposited in MCNV (mostly in the author's collection), MHNG, and ZSM (parts of M. VON TSCHIRNHAUS' alcohol collection; collecting chiffres are noted after "st.").

3 Taxonomic account

3.1 List of species

Tethina alboguttata (Strobl, 1900)

Distribution

Afrotropical: St. Helena. – Palaearctic: Algeria, Canary Islands, ?Italy, Madeira, Morocco, Spain, Tunisia.

Discussion

MUNARI (2004) recorded this species from Agdz (Ouarzazate), a desert oasis of Morocco situated about 310 km inland.

Tethina czernyi (Hendel, 1934)

Material examined [MCNV]

Algeria: Atlas Setif, Sebkhet Melloul [about 70 km inland], st. 8, V.1949, A.G.S., 1 ♂ [handwritten label "*Tethina grisea* Fll. det. SÉG."]. – **Turkey**: Asia Minore [Asia Minor], Gölbasi (Ankara) [over 190 km inland], prato [meadow], su fiori [on flowers], 18.V.1961, A.G.S., 1 ♂, 1 ♀.

Distribution

Palaearctic: Algeria, Bulgaria, Cyprus, Egypt (Sinai), France, Germany, Hungary, Israel, Italy, Mongolia, Poland, Spain, Tadjikistan, Tunisia, Turkey, Turkmenistan, Uzbekistan. – New to Algeria.

Tethina flavoidea Beschovski, 1997

Material examined [MCNV, MHNG]

Israel: En Mor [over 75 km inland and about 66 km from the southern basin coast of the Dead Sea], 16.III.1995, B. MERZ, 3 ♂♂, 4 ♀♀.

Distribution

Palaearctic: Egypt (Sinai), Israel.

Tethina gatti Munari & Ebejer, 2001

Material examined [MCNV]

Algeria: Sahara Algerino [Algerian Sahara], Biskra 15 km S [over 210 km inland], source eau [spring], 22.II.1980, A.G.S., 1 ♂; Sahara Algerino [Algerian Sahara], Chegga source [about 250 km inland], temp. 45 °C, 12.II.1980, A.G.S., 1 ♂.

Distribution

Palaearctic: Algeria, Tunisia. – New to Algeria.

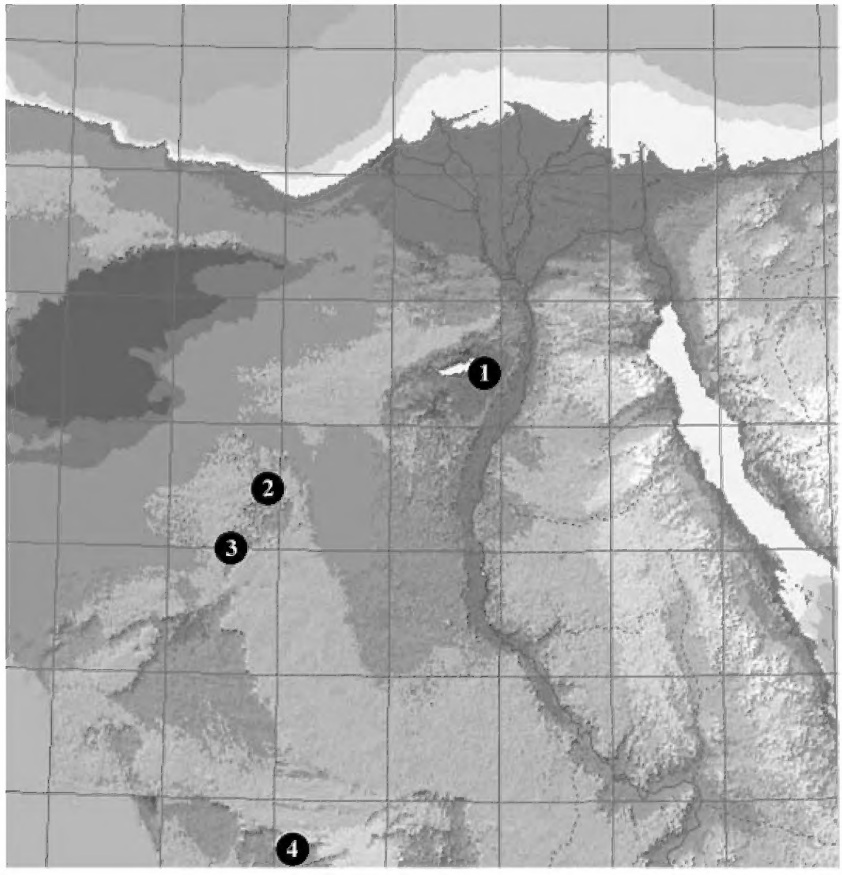

Fig. 2. Eremic biotopes of Egypt. – 1. El Fayoum Oasis. 2. Bahariy-Bawiti Oasis. 3. Road "Bahariya → Farafra" near Ain Khoman Oasis. 4. Dakhlah Oasis.

Discussion

The Algerian sites in which the above specimens were found constitute the second and third records, respectively, of this rare species since its description. This new taxon was described on specimens from a saltmarsh at Sidi Bou Ali (near Sousse or Susah), a Tunisian locality near the Mediterranean coast. The present records reveal the occurrence of this interesting species also from eremic biotopes of Algeria, far from the maritime environment.

Tethina cf. *grisea* (Fallén, 1823)

Material examined [MCNV]

Algeria: Sahara Algerino [Algerian Sahara], Biskra 15 km S [over 210 km inland], source eau [spring], 22.II.1980, A.G.S., 1 ♀.

Distribution (of *Tethina grisea*)

Palaearctic: Azores, Belgium, Bulgaria, Canary Islands, Cyprus, Denmark, England, Finland, France, Germany, Greece (Crete), Israel, Italy, Malta, Netherlands, Norway, Spain (including Balearic Islands), Sweden, Tunisia, Turkey, Turkmenistan, Ukraine.

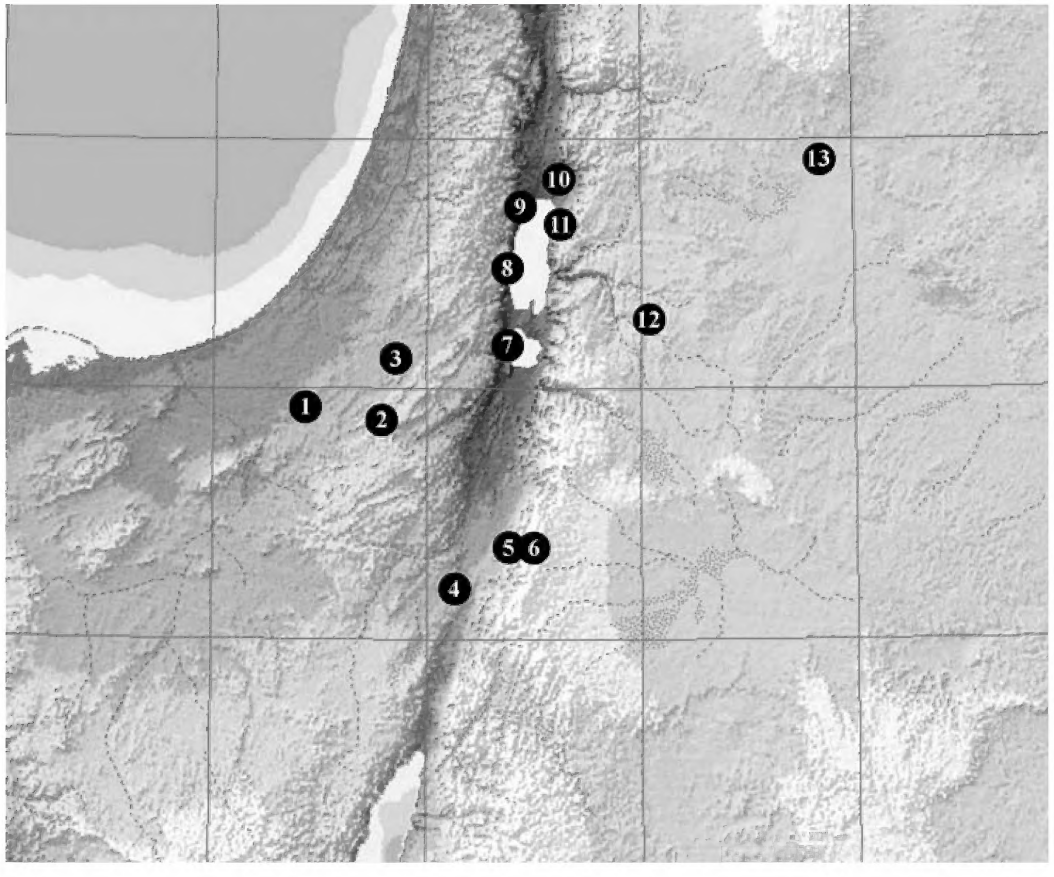

Fig. 3. Eremic biotopes of Israel and Jordan. – 1. Sede Halamish. 2. En Mor. 3. Bor Mashash. 4. Mishor Paran. 5. Petra. 6. Wadi abu Ullayqa. 7. Newe Zohar. 8. En Gedi. 9. Enot Zukim. 10. Dead Sea (north of east coast). 11. Hammamat Ma'in. 12. Road Amman → Aqaba, Al Qatranah. 13. Al Azraq ash Shamali Oasis.

Discussion

The examined specimen is exteriorly somewhat different from the typical, common specimens of this species, which is usually found in proximity to sea shore biotopes. The mesonotal setulae of this specimen are rather small, and the entire mesonotum is brown. Also, the gena shows a peculiar, translucent, tiny patch, and 2 proepisternal setae (?supranumerary seta) are present on each side of the thorax. Pseudopostocellars apparently short. I strongly suspect that this specimen belongs to an undescribed species, possibly related to *T. grisea*. At the moment, I maintain a tentative identification until additional material, especially males, becomes available for examination.

Tethina guttata Freidberg & Beschovski, 1996

Distribution

Palaearctic: Israel, Tunisia.

Discussion

This species was described on specimens from Bor Meshash (or Mashash), an Israeli locality situated over 62 km inland and about 50 km from the southern basin coast of the Dead Sea, from Sede Halamish (near Nizzana, Israel), about 50 km inland, and from a Tunisian place named Biro, near Gafsa. Freidberg & Beschovski (1996) state that *T. guttata* "is the only species in this group [*alboguttata* group] that was found at a considerable distance from the sea coast [*omissis*], indicating the ecological affinity of the entire group to dry sand habitats".

Tethina incisuralis (Macquart, 1851)

Material examined [MCNV, MHNG, ZSM]

Algeria: Biskra [about 200 km inland], st. 20, 20.IV.–2.V.1949, A.G.S., 1 ♂, 1 ♀; Hoggar, Tamanrasset [about 1300 km inland], st. H 12, 15.–30.IV.1950, A.G.S., 1 ♀; Sidi Aoun, N of El Oued [about 295 km inland], 100 m, st. X769d, 33.31 N – 06.59 E, 24.IV.1984, P. Ohm, 4 ♂♂, 3 ♀♀; Still (Biskra) [about 270 km inland], su [on] *Tamarix*, 30.V.1980, A.G.S., 1 ♂. – **Egypt**: Bahariy-Bawiti Oasis (5 km NNE of Al Bawiti) [about 270 km inland], st. X787, 28.21 N – 28.51 E, 17.III.1992, R. Mannesmann & S. Beeg, 3 ♂♂, 4 ♀♀; Dakhlah Oasis (S of Budkhula) [about 590 km inland], st. X788, 15.III.1992, R. Mannesmann & S. Beeg, 5 ♂♂, 6 ♀♀; El Fayoum Oasis [about 220 km from the Mediterranean coast, and 150 km from the northern coast of the Gulf of Suez], st. X783, 13.III.1992, R. Mannesmann & S. Beeg, 1 ♀. – **Israel**: Bor Mashash [over 62 km inland and about 50 km from the southern basin coast of the Dead Sea; sand dunes, B. Merz pers. comm.], 16.III.1995, B. Merz, 9 ♂♂, 7 ♀♀ [1 ♂ with vertex, occiput, and mesonotum (incl. scutellum) covered with a peculiar silky brown microtomentum]; En Mor [over 75 km inland and about 66 km from the southern basin coast of the Dead Sea], 16.III.1995, B. Merz, 4 ♂♂, 2 ♀♀; Enot Zukim (Ein Fashkha) [northern coast of the Dead Sea, about 76 km from the Mediterranean coast, hot spring, B. Merz pers. comm.], 19.III.1995, B. Merz, 1 ♂; Mishor Paran, 70 km N Elat [over 150 km from the Mediterranean coast and 70 km from the northern extremity of the Gulf of Aqaba; oasis with desert vegetation, B. Merz pers. comm.], 17.III.1995, B. Merz, 3 ♂♂ [1 ♂ with scutum having four longitudinal brown stripes, scutellum brown medially, femora blackish as in *T. nigrofemorata* Beschovski and surstylus slightly atypical, long and slender, somewhat sabre shaped]; Newe Zohar [southernmost border of the Dead Sea, over 100 km from the nearest coast of the Mediterranean; hot spring, B. Merz pers. comm.], 19.III.1995, B. Merz, 8 ♂♂, 4 ♀♀ [1 ♂, 1 ♀ are characterized by their very small size, as well as by mesonotal setulae strongly impoverished in numbers, particularly the acrostichal ones]. – **Jordan**: Dead Sea (north of east coast) [about 90–100 km from the Mediterranean coast], st. X799, 14.IV.1992, M. v. Tschirnhaus, 1 ♂, 2 ♀♀; Hammamat Ma'in (SW of Ma'daba) [near the north-eastern edge of the Dead Sea, about 95 km from the Mediterranean coast], st. X801, 17.IV.1992, M. v. Tschirnhaus, 1 ♀ (cf.).

Distribution

Palaearctic: Algeria, Canary Islands, Egypt, England, Greece (Crete), Israel, ?Italy, Jordan, Malta, Morocco, Spain, Syria, Tunisia, Turkmenistan.

Discussion

In the West Palaearctic Region, *Tethina incisuralis* is no doubt the most representative and frequent among the species that often inhabit eremic and other inland places. Noteworthy is the citation of the above record from Tamanrasset, a remote desertic place situated about 1300 km from the sea coast.

Tethina longirostris (Loew, 1865)

Material examined [MCNV]

Algeria: Atlas Setif, Sebkhet Melloul [about 70 km inland], st. 8, 20.IV.–2.V.1949, A.G.S., 1 ♂, 1 ♀ [the female with a handwritten label "*Tethina pictipes* Bck det. Ség."].

Distribution

Palaearctic: Algeria, Cyprus, Egypt, Germany, Greece (Crete), Israel, Italy, Malta, Spain, Tunisia.

Tethina nigrofemorata Beschovski, 1997

Material examined [MCNV, ZSM]

Algeria: Sahara Algerino [Algerian Sahara], Ghardaia [over 460 km inland], 18.II.1980, A.G.S., 1 ♀; Sahara Algerino [Algerian Sahara], Oued Djedi [probably near Laghouat] [over 310 km inland], peupl. litorip. [riverbank population], 22.II.1980, A.G.S., 1 ♀. – **Egypt**: El Fayoum Oasis [about 220 km from the Mediterranean coast and 150 km from the northern coast of the Gulf of Suez], st. X785, 13.III.1992, R. Mannesmann & S. Beeg, 1 ♀. – **Jordan**: Al Azraq ash Shamali Oasis (85 km E of Amman) [about 195 km from the Mediterranean coast and 120 km from the northern edge of the Dead Sea], st. X795, 11.–15.IV.1992, M. v. Tschirnhaus, 12 ♂♂, 35 ♀♀; Petra [about 160 km from the Mediterranean Sea, 97 km from the northernmost edge of the Gulf of Aqaba, and 86 km from the southernmost edge of the Dead Sea], st. X806, 21.IV.1992, M. v. Tschirnhaus, 1 ♀; Petra, Wadi abu Ullayqa [see the above distances for Petra], st. X805, 890 m, 20.IV.1992, M. v. Tschirnhaus, 8 ♂♂, 5 ♀♀.

Distribution

Palaearctic: Algeria, Canary Islands, Cyprus, Egypt, France, Greece (Crete), Israel, Jordan, Malta, Spain, Tunisia. – New to Algeria, Egypt, and Jordan.

Discussion

A species closely related to *Tethina incisuralis*. It chiefly differs from the latter species by the following combination of characters: femora always blackish (in *T. incisuralis* the legs are generally uniformly yellowish, except for the hind tibia that shows a dark brown ring apically, even though there are specimens sometimes with blackish femora as in *T. nigrofemorata*), hind tibia strongly infuscated apically or often on the entire apical third, surstylus of male terminalia sharply subtriangular in lateral view, gradually attenuating in width towards pointed apex. The two species are rather frequent in the eremic places of the Mediterranean area.

Tethina ochracea (Hendel, 1913)

Material examined [MCNV, ZSM]

Algeria: Sahara Algerino [Algerian Sahara], El Golea Lac [salt lake] [about 640 km inland], 5.VI.1980, A.G.S., 1 ♀; Sahara Algerino [Algerian Sahara], Ghardaia, Oued M'Zab [over 470 km inland], 5.VI.1980, A.G.S., 1 ♂, 1 ♀; Sahara Algerino [Algerian Sahara], Oued Bechar a [at] Bechar [about 390 km inland], zona sabbiosa nuda [bare sand zone], 25.–26.IV.1953, A.G.S., 1 ♂. – **Egypt**: Road "Bahariya → Farafra" (55 km SSW of El-Bawiti) [near Ain Khoman Oasis, about 325 km inland], swept on a 100 m² vegetation area at broken water pipe line in extreme sand desert, st. X786, 27.54 N – 28.34 E, 16.III.1992, R. Mannesmann & S. Beeg, 22 ♂♂, 16 ♀♀. – **Jordan**: Al Azraq ash Shamali Oasis (85 km E of Amman) [about 195 km from the Mediterranean coast and 120 km from the northern edge of the Dead Sea], st. X795, 11.–15.IV.1992, M. v. Tschirnhaus, 2 ♀♀ [cf. – specimens with a slightly protrudent facial carina]; Road 15 "Amman → Aqaba", Al Qatranah (Rest-House "Petra") [about 150 km from the Mediterranean coast and 50 km from the south-eastern edge of the Dead Sea], st. X802,

23.IV.1992, M. v. TSCHIRNHAUS, 3 ♀♀ [cf. – specimens with a slightly protrudent facial carina].

Distribution

Subcosmopolitan. Afrotropical: Cape Verde Islands, Senegal, Seychelles (Aldabra), South Africa. – Australasian/Oceanian: Australia. – Oriental: Taiwan. – Nearctic: Bermuda, USA (Texas). – Neotropical: Chile, Mexico. – Palaearctic: Algeria, Azores, Bulgaria, Canary Islands, Cyprus, Egypt, France, Greece, Israel, Italy, Jordan, Madeira, Malta, Spain (including Balearic Islands), Tunisia, Turkey. – New to Jordan.

Discussion

This species is exteriorly similar to *Tethina strobliana*, with which it can be easily confused. It differs from the latter species chiefly by the following combination of characters: translucent, longitudinal stripe of gena distinctly broad, higher than one third of height of gena (in *T. strobliana* the stripe is as high as one third or less of genal height), acrostichal setulae arranged in two more or less distinct rows, shape of surstylus of a peculiar form, ankle-boot shaped in lateral view and bearing numerous strong, stout spinulae on inner edge. On the basis of the currently available data it appears that this species is particularly thermophilous and perhaps dry resistant, thus replacing *T. strobliana* in the torrid, desert biotopes of the Mediterranean subregion, whereas the latter species is commonly found in the inland biotopes of some less extreme regions (see Introduction). Of course, it would be of basic interest to ascertain whether the identifications quoted in literature are correct, and refer to *T. strobliana* properly, or, conversely, whether they are misidentifications of the two closely related species *T. ochracea* and *T. strobliana*.

Tethina pallipes (Loew, 1865)

Material examined [MCNV].

Israel: En Gedi/N. Arugot [western edge of the Dead Sea, about 81 km from the Mediterranean littoral], 31.V.2000, B. MERZ, 1 ♂.

Distribution

Palaearctic: Bulgaria, France, Greece, Israel, ?Italy, Tunisia.

Discussion

I regard LOEW's taxon as an obscure species possibly conspecific with *Tethina strobliana* (Mercier, 1923) or *T. ochracea* (Hendel, 1913). Unfortunately, the types of this species preserved in ZMHB are strongly damaged. In 1992 Dr. H. SCHUMANN, at that time curator of Diptera at ZMHB, communicated to me the poor condition of the type series: "*Rh. pallipes* Loew, 1865, Griechenland, 1 Syntypus ohne Abdomen (auf Etikett das ♂-Zeichen), 1 ♀ ohne Kopf, ein Tier ohne Abdomen". It should be stressed that specimens of *Tethina* in such bad conditions are not safely identifiable. Therefore, the identification of this specimen from Israel was based primarily on the concept of this species according to BESCHOVSKI (1993, 1994).

Tethina sp. near *salinicola* Beschovski, 1998

Discussion

MUNARI (2004) recorded this species from Morocco: Tamri (Agadir), and Taliouine (Ouarzazate), the latter being a desert locality situated about 310 km inland. Possibly an undescribed species closely related to *T. salinicola* Beschovski, 1998, or a geographical race of it.

Tethina strobliana (Mercier, 1923)

Tethina sp. of CANZONERI & MUNARI (1984).

Material examined [MCNV]

Italy: Montegrotto [province of Padua, about 30 km inland], sorgenti calde [hot springs], 7.IX.1957 and XI.1958, A.G.S., 3 ♂♂, 1 ♀, 1 undet. sex.

Distribution

Palaearctic: ?Azores, Belgium, Bulgaria, Denmark, England, France, Germany, Greece (Crete), Hungary, Israel, Italy (including Sardinia), Kazakhstan, Malta, Poland, Russia (Sea of Azov), Spain, Tadjikistan, Tunisia, Turkmenistan, Ukraine, Uzbekistan.

Discussion

The biotope in which this species was collected in 1957 and 1958 has since been dramatically modified by human activities. It is now a famous tourist resort with hotels, shops, houses, and spa structures. Originally, the hot springs of Montegrotto were characterized by hot salty waters (up to 87 °C in the Montirone spring) where some relict halophytes such as *Crithmum maritimum* L., *Sonchus maritimus* L., and *Puccinellia palustris* (Seenus) Hayek grew undisturbed (CANZONERI & MUNARI 1984). Furthermore, a peculiar algal microflora formed by Oscillatoriaceae was and is still particularly abundant in the reservoir "fango" (clay mud from Italy used in the treatment of rheumatic diseases). The specimens from this site are chiefly characterized by having acrostichal setulae rather impoverished in numbers (2 rows, sometimes with a few additional, lateral, thin setulae) and thickness, as well as for the somewhat stumpy surstylus, similar to that figured by BESCHOVSKI & NARTSHUK (1997, pl. 5, figs. 2, 4–5). CANZONERI & MUNARI (1984) hypothesize that the specimens from Montegrotto belong to a Würmian glacial relict population of *Tethina*, but this needs to be supported by evidence.

3.2 Conclusions

In this brief paper it has been broadly corroborated that many *Tethina* species should be regarded as halophilous/thermophilous rather than strictly thalassophilous flies. In all probability, saline biotopes provide a species-rich microalgal pabulum as well as chemical-physical factors that are indispensable for feeding and breeding habits respectively, and are likewise basic for the preimaginal development of these insects. Conversely, the remaining seven world genera of the subfamily Tethininae, as well as all the species in both the subfamilies Horaismopterinae and Apetaeninae (the family is subdivided into five subfamilies that include 17 genera with approximately 160 species), seem to be strictly dependent on the proximity of

maritime environments such as sandy beaches, rocky shores, mangroves, littoral lagoons, maritime salt marshes, and oceanic atolls. In particular, some species of Apetaeninae often occur also on sea-bird guano and are associated with colonies of penguins and other sea-birds inhabiting the subantarctic islands (MATHIS & MUNARI 1996, VOCKEROTH 1987).

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